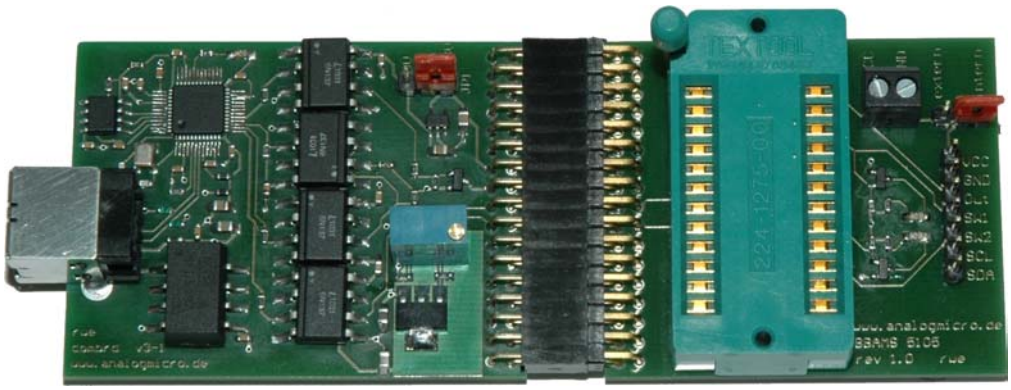
USB Starter Kit AMS 5105

User Guide

USB Starter Kit AMS 5105



analog microelectronics

Analog Microelectronics GmbH
An der Fahrt 13, D – 55124 Mainz

Phone:+49 (0)6131/91 0730-0
Fax: +49 (0)6131/91 073-30
Internet: www.analogmicro.de
E–Mail: info@analogmicro.de

May 2012 - Rev. 1.0

USB Starter Kit AMS 5105

CONTENTS

INTRODUCTION 3

HARDWARE 3

SOFTWARE – *CS5105* 5

Installation 5

CS5105 user Interface 5

INITIAL OPERATION 12

IMPORTANT NOTES 13

ADDITIONAL EQUIPMENT 13

ADDITIONAL DOCUMENTS 13

USB Starter Kit AMS 5105

INTRODUCTION

The USB Starter Kit AMS 5105 is designed for easy individual configuration and adjustment of the two switching outputs of AMS 5105 pressure sensor/ pressure switch using a standard PC with USB interface. Together with the relevant software the customer can configure the two independent switching outputs of the AMS 5105 as normally open, normally close or in window mode and can adjust the specific thresholds, hysteresis and switching delays for both switching outputs individually.

In addition it is possible to display the AMS5105 internal calculated corrected digital pressure and temperature values for analysis purpose using the starter kit software.

The starter kit consists of two printed circuit boards and the relevant communication software package C*S5105* distributed on the starter kit CD. A Windows PC with an USB port and with operating system XP SP3 or above is required for operation. The kit will be supplied by the USB port, an external supply isn't necessary.

NB: We recommend that you read the AMS 5105 sensor datasheet before putting the starter kit into operation.

Hardware

The starter kit hardware consists of two printed circuit boards: the communication board *CB-I2C* and the adapter board *BB5105* with a ZIF-socket to connect one AMS 5105 sensor. Figure 1 shows the assembled kit with mounted sensor.

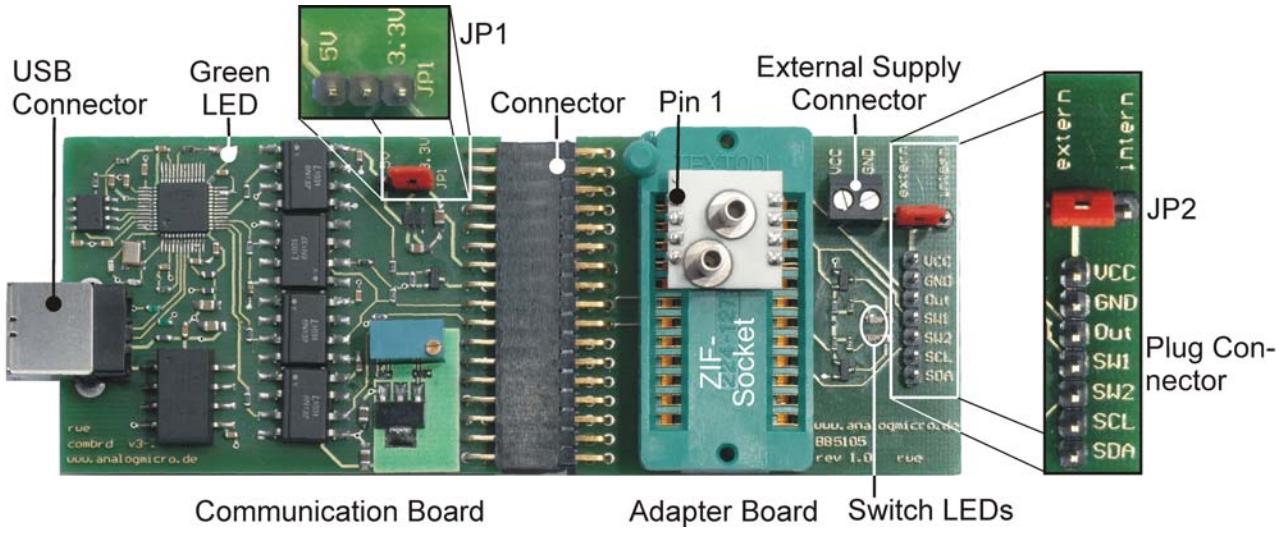


Figure 1: USB Starter Kit AMS 5105 with connected sensor.
The kit consists of a communication board CB-I2C and an adapter board BB5105, connected by a 34-pin connector.

The *CB-I2C* printing circuit board provides the hardware which enables a PC with USB-2.0 port to communicate with a pressure sensor with I2C interface. The *BB5105* printed circuit board provides an easy way to connect an AMS 5105 pressure sensor with the *CB-I2C*. The two printed circuit boards are connected by a 34 pin connector.

Using a standard USB cable the USB jack on the *CB-I2C* is connected to a free USB-port at the PC. The PCs USB-port is used for communication and for power supply of the starter kit and the connected pressure sensor; an additional supply isn't required.

The connection between *CB-I2C* and *BB5105* is realised by a 34 pin connector. A zero injection force (ZIF) socket on the *BB5105* allows easy mounting and exchanging of an AMS 5105 pressure sensor/ pressure switch. Pin 1 of the sensor is at the upper left edge of the ZIF-Socket (see Figure 1).

For the internal power supply of the connected AMS 5105 by the USB Port, JP 2 on board BB5105 has to connect to position "intern". Additionally the sensors supply voltage has to be chosen by the jumper JP1 on board CB-I2C (see Figure 1); for standard products of AMS 5105 series connect JP1 to 5V.

For external supply of the connected AMS5105, remove jumper JP1 and connect jumper JP2 to position "extern". Subsequent the external power supply can be connected to the screw terminal block "external supply connector" on board *BB5105.*

Further, for exchanging the mounted AMS5105 the sensor voltage supply can be turned off by removing JP1 and JP2.

The jumper positions are summarised in table1.

At the 7 pin plug connector on the *BB5105* the sensors supply voltage VCC, GND, the switching outputs SW1 and SW2, the analog output and the I2C bus lines are connected. This plug can be used for monitoring the sensor supply voltage and further for connecting and testing sensors, which are already. The logic level of the switching outputs is displayed by the two LEDs *Switch LED1* and *Switch LED2* (see Figure 1).

For safety in cause of failure an electrical isolation between the sensor and the PC was realised on the *CB-IC*. This avoids effectively an energy flow into the connected PC.

Table 1: Jumper configuration of JP1 on *CB-I2C* and JP2 on *BB5105*

Sensor voltage	Jumper position JP1	Jumper position JP2
internal supply 3.3 V	central pin together with pin 3.3V	central pin together with pin intern
internal supply 5 V	central pin together with pin 5V	central pin together with pin intern
external supply	removed	central pin together with pin extern
turned off	removed	removed

Important: If JP1 isn't removed in case of an external sensor power supply at pin VCC, the starter kit can be damaged!

Software – *CS5105*

The communication between the PC and the pressure sensor /switch AMS 5105 mounted onto the starter kit is realised by means of the software package *CS5105*. This software is provided on the starter kit CD and runs under Windows operating systems (XP SP3 or above).

Installation

Before installation of the software package *CS5105,* please disconnect the starter kit. By executing the file *CS5105_Setup.exe* on the CD-ROM (must be run as an administrator), an installer is started which guides through the installation process. After the installation process is finished, the necessary files for operating the starter kit are copied to the target directory and the needed drivers are installed, too. The starter kit is now ready to use and can be connected to the PC.

CS5105 user Interface

The software *CS5105* is run via the "AMS 5105" icon in the program group "AMS 5105" in the folder programs in the windows start menu.
The user interface (menu) is shown in Figure 2. The menu is divided in three submenus: "Communication Check", "Configuring Switching Output" and "Measurement" which are designed as index sheets. They will be described in detail below.

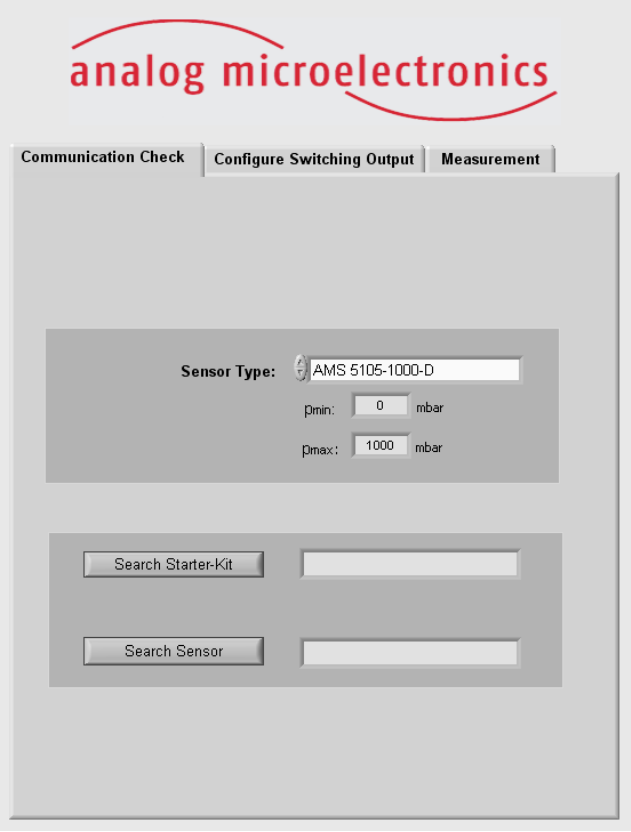


Figure 2: *CS5105* user interface.

Submenue “Communication Check”

In the submenu “Communication Check” (see Figure 3) the type of the AMS5105, which is connected to the starter kit, has to be defined and the communication between the PC and the AMS5105 can be established and tested.

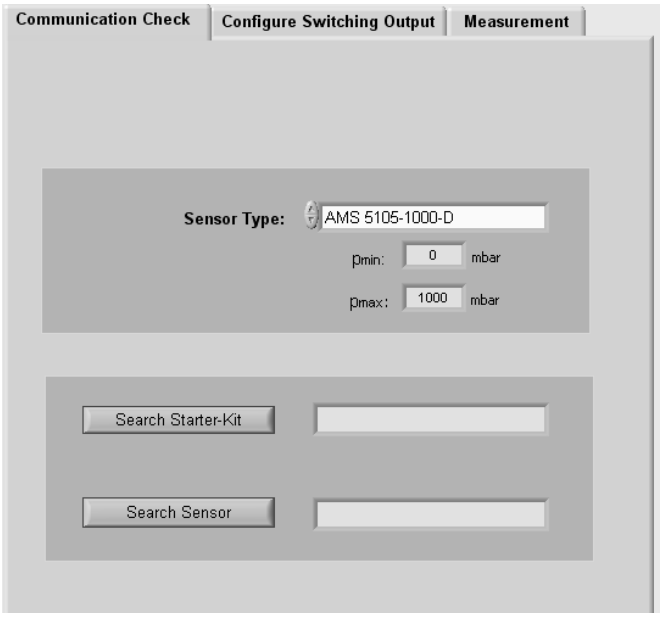


Figure 3: Submenu “Communication Check”

With the drop down menu “Sensor Type”, the exact AMS 5105 sensor type connected to the starter kit has to be selected with its exact ordering code (e.g.: AMS 5105-0005-D) (see Figure 4 left). For the selected type the sensor pressure range is shown below. In the case of a custom specific version or a sensor which is not listed in the menu, the sensor type “customised” has to be selected. In that case the specified minimal and maximal pressure values p_{min} and p_{max} have to be filled into the adequate fields below (as shown in Figure 4 right).

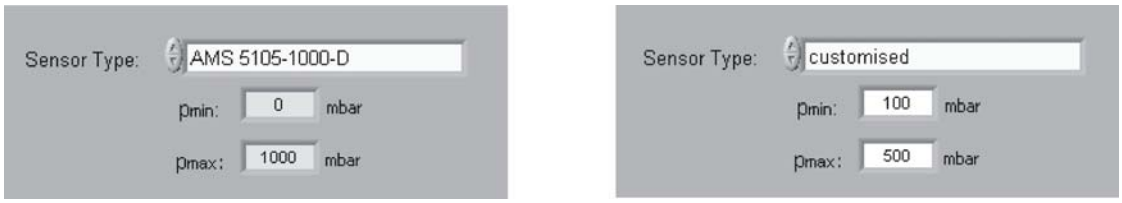


Figure 4: Selection of the used AMS 5105 sensor type
Left: sensor type AMS 5105-1000-D with a measuring range of 0- 1000 mbar
Right: custom specific sensor with manually adjusted measuring range of 100 - 500 mbar.

NB: If the wrong sensor type is selected within the drop down menu “Sensor Type”, the displayed threshold and hysteresis values in mbar in the submenu “Configuring Switching Output” are wrong. Further, the sensor measurement data in the submenu “Measurement” cannot be accurately evaluated and the displayed pressure value in physical units is wrong, too!

The link connection between the PC and the starter kit will be initiated by pushing the button “Search Starter Kit”. If it’s successful (message: “Found Starter Kit” in Figure 5 left), the starter kit will be ready to use. Now, a connection to the AMS5105 (mounted onto the starter kit) can be established. After pushing the button “Search Sensor” the software searches for an AMS 5105 sensor /switch. If it’s successful, the message “Sensor corresponds” will be displayed (see Figure 5 right).

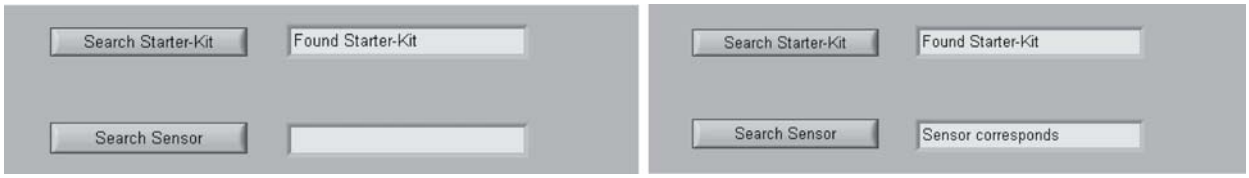


Figure 5: Establish communication between PC and sensor.
Left: A connection to the starter kit was established. Right: A sensor was found

If no starter kit was found after pushing the button “Search Starter Kit” please follow the tips given in section *Initial Operation* paragraph 5. In case of the error message “No slave was found” is displayed (after pushing the button “Search Sensor”) please check the following: the connection of the two PCBs, the position of JP1, the position of the AMS 5105 in the ZIF socket and the locking of the ZIF-socket.

Submenu “Configure Switching Output”

In the subsection menu “Configure Switching Outputs” (see Figure 6) the user can individually configure the two independent switching outputs SWITCH1 and SWITCH2 of an AMS 5105 pressure sensor /switch. The possibilities for the individual settings for each switching output are arranged in two grey fields labelled with “Switch 1” and “Switch 2” respectively. For each of the two switching outputs the customer can chose the switching function and adjust the specific threshold, switching hysteresis and a switching delay. These configuration settings will be described in detail below.

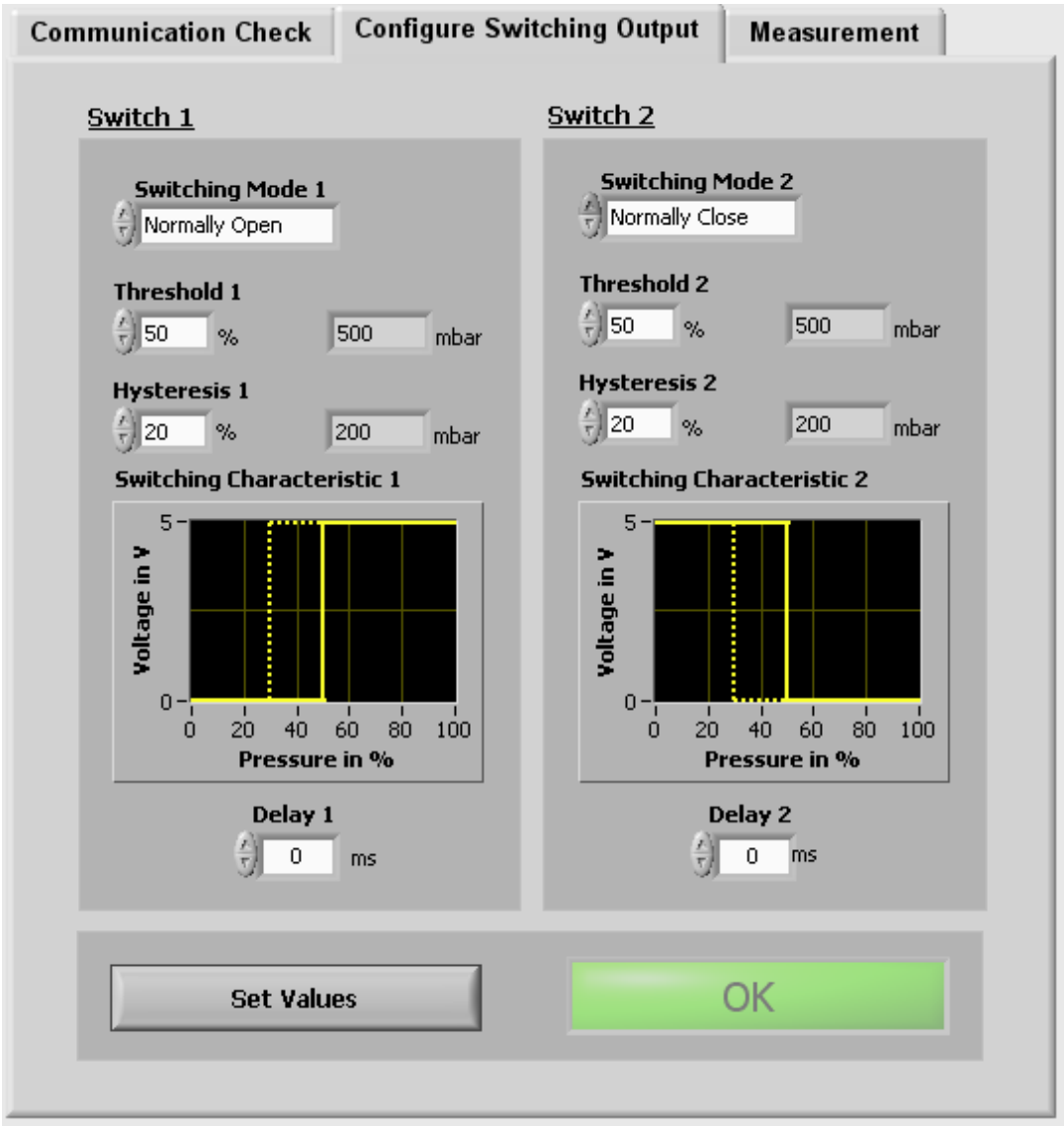
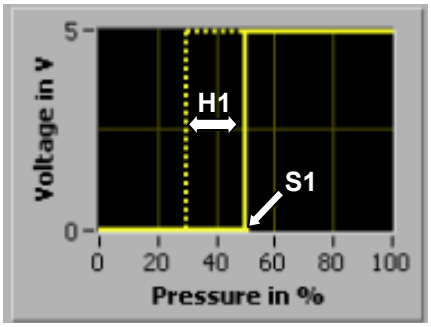


Figure 6: View of submenu “Configure Switching Output”

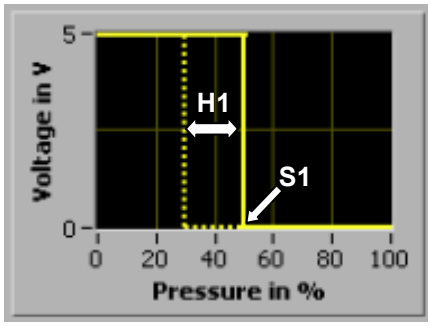
The basic function of each switching output is to be set in the particular drop down menu “Switching Mode”. The selectable configurations for the two switching outputs SWITCH1, SWITCH2 are: “Off”, “Normally Open”, “Normally Close” and “Window Mode”, which are detailed descript in the following.

- "**Off**"*:* The particular switching port is deactivated.
- "**Normally Open**": The particular switching port is configured as normally open (NO) with an adjustable threshold and hysteresis:



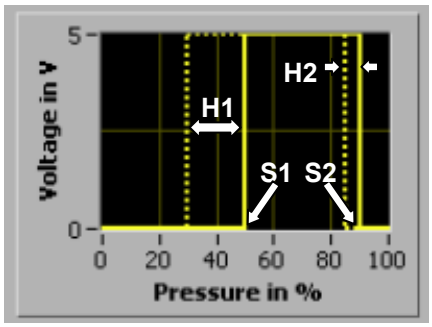
To begin with a measured pressure below the adjusted threshold S1 (here 50%), the switching output is set low-level (0V). If first time the measured pressure exceeds the adjusted threshold S1, the output changes from low-level to high-level (5V). If thereafter pressure is falling down below the threshold S1, the output stays high-level until the pressure is falling down below a threshold S1-H1 (here 30%), which is the adjusted threshold S1 minus the adjusted hysteresis H1 (here 20%). For pressures below that threshold S1-H1 the output changes back to low-level.

- "**Normally Close**"*:* The particular switching port is configured as normally close (NC) with an adjustable threshold and hysteresis:



To begin with a measured pressure below the adjusted threshold S1 (here 50%), the switching output is set high-level (5V). If first time the measured pressure exceeds the adjusted threshold S1, the output changes from high-level to low-level (0V). If thereafter pressure is falling down below the threshold S1, the output stays low-level until the pressure is falling down below a threshold S1-H1 (here 30%), which is the adjusted threshold S1 minus the adjusted hysteresis H1 (here 20%). For pressures below that threshold S1-H1 the output changes back to high-level.

- **"Window Mode**": Both switching ports are working as complementary window comparators with two adjustable thresholds S1, S2 and two associated hysteresis H1, H2:



To begin with a measured pressure below the adjusted threshold S1 (here 50%), the switching output is set low (0V). If first time the pressure exceeds the adjusted threshold S1, the output changes from low to high (5V). For a pressure in between the thresholds S1 and S2, the output stays high. If pressure exceeds also threshold S2 (here 90%), the output changes back to low. With the adjusted hysteresis H1 (here 20%) and H2 (here 5%) the behaviour for falling pressure is the following: If the pressure is falling down below the threshold S2-H2 (here 85%), the output changes from low to high. It remains high until the pressure is falling below a threshold S1-H1 (here 30%). Below S1-H1 the output changes back to low-level.

The drop down menus "Threshold" and "Hysteresis" are for the individual adjustment of threshold and hysteresis for the switching output SWITCH1 respectively SWITCH2. Each adjustment is done in % pressure (which refers to the specified pressure full span, the algebraic difference between the specified minimum and maximum pressure for the selected sensor type). In addition the stipulated thresholds (switching points) and hysteresis are displayed in mbar.

The switching behaviour of the AMS 5105 particular switching output, which was stipulated within the previous drop down menus is displayed in the graph "Switching Characteristic" (1 and 2 respectively). Therein the continuous line is the characteristic curve for increasing pressure from minimal to maximal value, the dashed curve is the characteristic curve for decreasing pressure from maximal to minimal value.

By the drop down menu “Delay” (below the particular graph) the user can adjust a switching delay for the particular switching output. During the selected time interval (in ms) the threshold (respectively threshold minus hysteresis) has to be passed permanently until the switching output changes its logic level. This switching delay avoids reliably an output switching in case of temporary pressure peaks.

By the button “Set” the stipulated settings are programmed in the EEPROM of the AMS5105. After successfully programming the panel “O.K.” shortly flash green. The AMS5105 pressure sensor/ pressure switch mounted on the *BB5105* is now individual configured and ready to use.

NB: To avoid permanent switching of the switching outputs for pressure values near by the selected thresholds, the hysteresis should be selected to >1%.

Submenu “Measurement”

Within the submenu “Measurement” (see Figure 7) it is possible to display the AMS 5105 internal calculated corrected digital pressure and temperature values.

The field “Sensor Type” (upper third part of the submenu) displays the selected senor type with its pressure range, which was stipulated in the submenu “Communication Check”.

With the buttons “Single Shot” and “Continuous Measurement” respectively (in the middle part of this submenu) the user can start a single measurement or a continuous measurement. In case of a continuous measurement, the time interval between the discrete measurements can be selected by the drop down menu “Loop Time”. The continuous measurement can be stopped by pushing the button “Continuous Measurement” again.

In the lower third of the submenu the measurement data for pressure and temperature are displayed as digital (decimal) values and also as values in physical units. For a single measurement “Single Shot” the current measurement data available at the AMS 5105 output register is one-time read and continuously displayed. In case of the continuous measurement the measurement data is repeatedly read out and displayed.

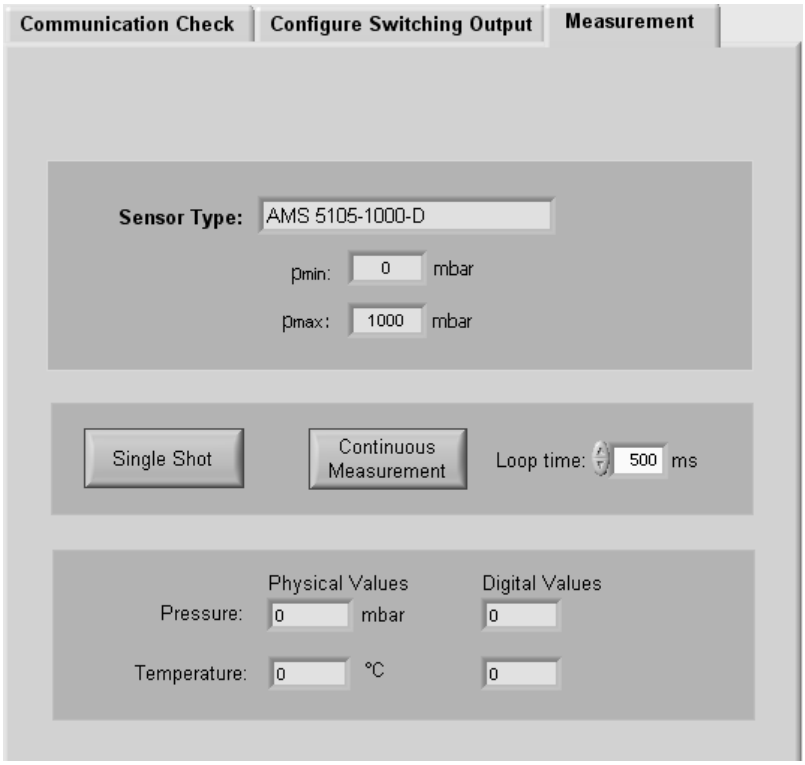


Figure 7: View on submenu “Measurement”.

The selected sensor type and its measuring range are displayed in the upper part of the submenu. In the middle part the user can be determine if a single shot or a continuous measurement should be started. The digital measurement values and the calculated values in physical units are displayed in the lower part.

INITIAL OPERATION

The following steps are necessary for the starter kit initial operation setup:

1. Installation of the Software *CS5105* (see section software)
2. Assembly of the starter kit

   First, the adapter board *BB5105* for AMS 5105 pressure sensor/ switch and the communication board *CB-I2C* are connected together by the 34 pin connector. Then, the AMS 5105 sensor has to be mounted into the ZIF socket on *BB5105* (orientation of pin 1: see Figure 1).
3. Select sensor voltage supply:

   For internal power supply (AMS 5105 is supplied by the USB Port), JP 2 on board BB5105 has to connect to position “intern“. Additionally the sensors supply voltage has to be chosen by the jumper JP1 to 5V.

   For external power supply (with additional power supply) remove jumper JP1 on Board *CB-I2C*. Connect the external power supply to the screw terminal block “external supply connector” on board *BB5105* and set jumper JP2 to position “extern“.
4. Connect the starter kit to a free USB-port at the PC by an USB cable.
5. The green LED on the communication board flashes up, when the board is detected by the PC and the drivers are loaded successfully (see Figure 1).

   If the green LED remains dark, the user has to look in the device manager for a new device called “USB Serial Converter” in the device group “USB-Controller”. If this doesn’t exist, the user has to disconnect the starter kit from the PC by removing the USB-cable. At a reconnection, the device “USB Serial Converter” should appear. If not, the problem could be solved by manually executing the file *Treiber_Setup.exe* in the program folder of the AMS 5105 Software (e.g.: C:\program files\AMS 5105). If the led remains still dark and the starter kit wasn’t found, contact Analog Microelectronics GmbH for further support.
6. A voltmeter can be connected up to the 7 pin plug connector on the *BB5105* if the AMS 5105 analog output signal or the voltage at switching ports SWITCH1 or SWITCH2 is also to be read.

NB: The analog output signal is ratiometric to the supply voltage. The adjusted thresholds are independent of the supply voltage, only the logic high-level changes with the supply voltage. If AMS 5105's specifications are to be tested, the supply voltage must be exactly 5.000 V. Any deviation in percent must be accounted for accordingly.
In case of internal power supply the internal supply voltage can be adjusted by the potentiometer on the *CB-I2C* (see Figure 1).

IMPORTANT NOTES

1. For changing an AMS 5105 pressure sensor while the communication board is connected to the PC, we recommend to remove the jumpers JP1 and JP2. It prevents sensor damage.
2. If JP1 won't be removed in case of external supply, the starter kit could be damaged
3. As there is no protective circuitry safeguarding against reverse polarity and overvoltage, the polarity and voltage of the external voltage supply of +5 V must be checked before voltage is applied.
4. The Communication Board *CB-I2C* can be used for read out pressure sensors of the series AMS 5812 and AMS 5915, too. For starting up, only the corresponding adapter boards *BB5812* respectively *BB5912* and the according software *CS5812* respectively *CS5915* are necessary.

ADDITIONAL EQUIPMENT

- USB-cable 2.0, FullSpeed A-St to B-St .

ADDITIONAL DOCUMENTS

- Data Sheet of AMS 5105 Pressure Sensor Series

Analog Microelectronics GmbH reserves the right to amend any dimensions, technical data or other information contained herein without prior notification.